Pollutant Load Predictions and Calculations

Presented by

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Agenda

- Estimating Pollutant Loading entering the system
  - Applying the TMDL model
  - Assimilative Capacity
  - Pollutants entering the system
- Mass Balance Equation
- Calculating Allowable Pollutant Loads

TMDL Definition

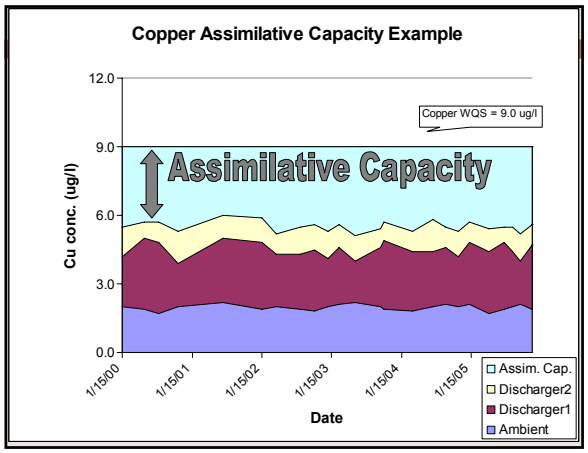
$$TMDL = \Sigma WLA_i + \Sigma LA_i + MOS$$

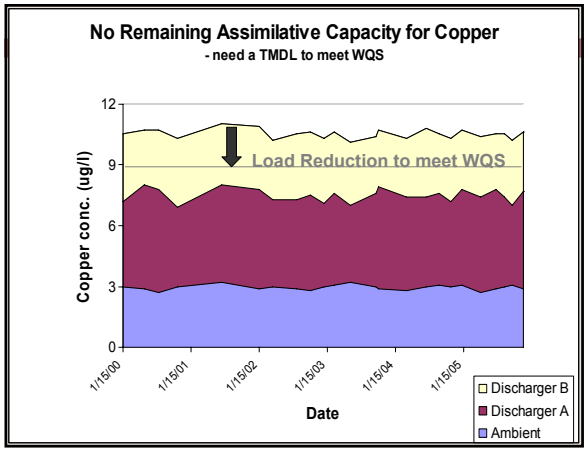
ΣWLA_i: Sum of waste load allocations (point sources)

ΣLA_i: Sum of load allocations (nonpoint sources)

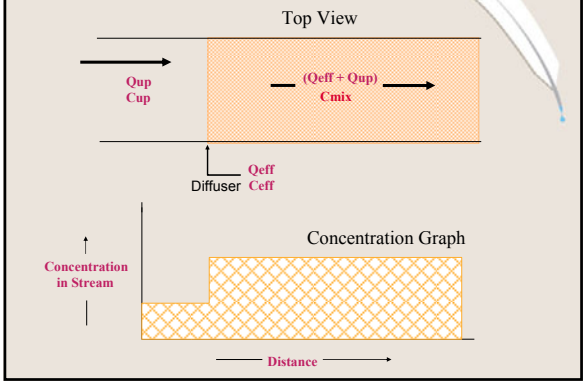
MOS: Margin of Safety

- Extra measure of protection due to uncertainty
- Can be explicit (e.g., 10%) or implicit (safety factors and assumptions in modeling, etc.)

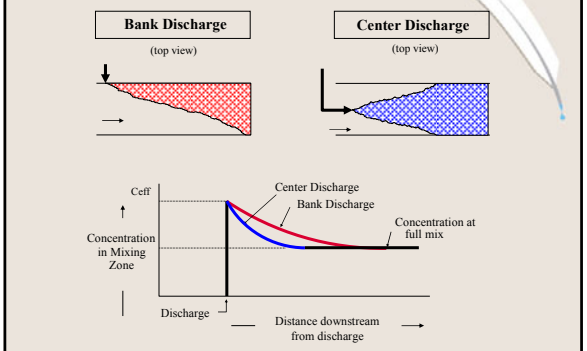

Copper Assimilative Capacity Example
12.0
9.0
6.0
3.0
0.0
Cu conc. (ug/l)
Copper WQS = 9.0 ug/l
Assimilative Capacity
1/15/00
1/15/01
1/15/02
1/15/03
1/15/04
1/15/05
Date
Assim. Cap.
Discharger2
Discharger1
Ambient


No Remaining Assimilative Capacity for Copper
- need a TMDL to meet WQS
12
9
6
3
0
Copper conc. (ug/l)
Load Reduction to meet WQS
1/15/00
1/15/01
1/15/02
1/15/03
1/15/04
1/15/05
Date
Discharger B
Discharger A
Ambient

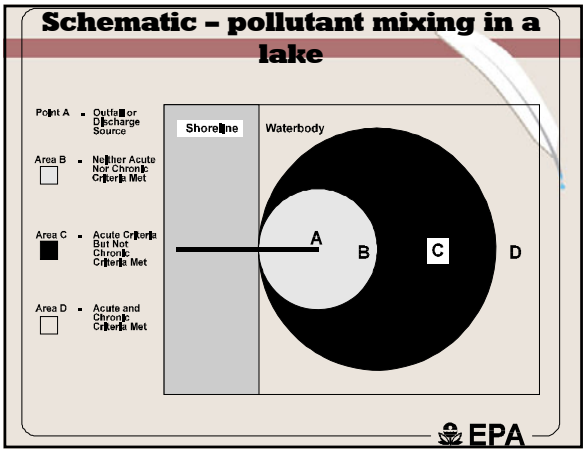
Schematic – pollutant fully mixing in a river



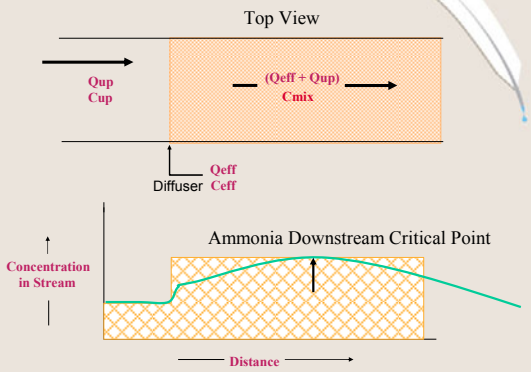
Schematic – bank/center mixing zones in rivers



Schematic – pollutant mixing in a lake



Ammonia – mixing & the critical point



Mass Balance Equation

$$(C_{up} \times Q_{up}) + (C_{eff} \times Q_{eff}) = (C_{mix} \times Q_{mix})$$

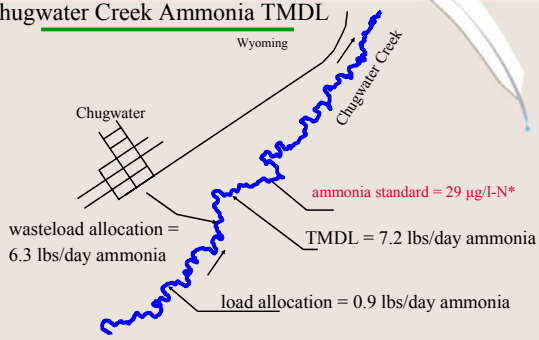
or

$$C_{eff} = \frac{(C_{mix} \times Q_{mix}) - (C_{up} \times Q_{up})}{Q_{eff}}$$

where:

- C_{eff} = effluent concentration
- Q_{eff} = effluent flow
- C_{up} = upstream concentration
- Q_{up} = upstream flow at critical conditions
- C_{mix} = downstream mix concentration (water quality standard)
- Q_{mix} = downstream mix flow ($Q_{up} + Q_{eff}$)

Chugwater Creek Ammonia TMDL



** 4 day average standard not to be exceeded once in 3 years*

Take Home Messages

- Assimilative Capacity to meet applicable criteria
- Investigate pollutant behavior
- Mass Balance Equation